Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	)	ET-Docket No. 93-62
Guidelines for Evaluating the Environmental	)	and Report and Order FCC 96-326
Effects of Radiofrequency Radiation	)	

To: The Commission

Comments, Endorsement, and Support for the PETITION FOR RECONSIDERATION filed by Arthur Firstenberg for the Cellular Phone Taskforce on September 3, 1996

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SUMMARY

There is strong evidence of nonthermal effects from which susceptible persons need protection, this includes many recently found effects.

To improve evaluations all persons near an area must be informed. Databases of the Commission should be used.

Notice that the Commission's exposure criteria does not protect against nonthermal effects should be given and include federal health agency statements.

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Herein are comments to support the Petition for Reconsideration of the Commission's Report and Order FCC 96-326 ("R&O") where such petition was filed by Arthur Firstenberg for the Cellular Phone Taskforce on September 3, 1996 ("Petition") and which was reported by the Commission in Public Notice No. 2154 issued in the above docket on September 18, 1996. These comments of response to this Petition are being timely filed within 15 days of such public notice persuant to 47 Code of Federal Regulations Part 1 §1.4(b)(1) and §1.429.

1. **Procedural considerations:** Perhaps due to misunderstanding, overlooked or new information, it is respectfully noted that the R&O, needs modifying to meet significant public health and safety concerns directly affecting some members of the Cellular Phone Taskforce and some members of our Association which endorses and supports the Petition.. For the most part, the Petition is based upon failure of the Commission to properly assess information available to the Commission in the record or referenced therein. To the extent this petition is supported by new findings that were not previously presented to the Commission, these facts and reports

became publicly available after the last opportunity for filing in this matter, and in any event, consideration of these facts significantly relates to changes needed for the public health and safety and is in the public interest. Should the Commission find that it will not make all of the modifications requested in the Petition, it is requested that the Commission will at least make the less restrictive modifications noted here. Should the Commission find it appropriate to modify other sections of 47 CFR to implement the intent of the proposed solutions in the above petition or the less restrictive modifications noted herein, it is requested that it do so, and make any other modifications it finds to be just and proper.

2. Introduction: The comments below support the following requests made in the Petition and which comments may indicate less restrictive measures if the Commission will not implement the following requests made in the Petition:

Request #1- Modifying Part 1 §1.1310 to protect susceptible individuals ***"from non-thermal effects of radiofrequency*** **(RF)** ***radiation within their own homes, and in public places."*** [pg. 6 of Petition]

Request #2- ***"Permitted power density for all frequencies above 100 MHz is less than the threshold reported in the scientific and medical literature for non-thermal bioeffects"*** [page 6 of Petition]. Please note this request is a sub-category of Request #1, since to protect susceptible individuals from non-thermal effects. Appropriate policy to meet this objective includes adopting the standard that exposures from its facilities be kept "as low as reasonably achievable."

Request #3- ***"Require routine environmental evaluation of all transmitters, facilities, and operations that are less than 2000 feet from any residence, without exception, to determine compliance with the exposure limits in §1.1310"*** [pg.7]. The comments below shall include day care centers and elementary and secondary schools as "residences", since children live so much of their lives at school and parents are often as concerned as if exposure was to their residence.. Also, residence shall be treated herein as anyplace where people reside: e.g. dormitories, long term care facilities, and hospitals. This also fulfills Request #1 to protect susceptible individuals in their homes (even temporary ones). Also, comments below will indicate actions and procedures that will help assure environmental assessments being properly made as indicated in Request #3.

Request #4- ***"All safety standards in §1.1307 and §1.1310 need to be adjusted to protect those with the greatest SAR for each frequency."*** [page 8 of Petition] (SAR being the specific rate of absorption of RF power per unit of body weight, and is measured in Watts per kilogram, W/kg). The Petition notes how ***"individuals of different body sizes absorb EMR (electromagnetic radiation) of a given frequency at different rates."*** [pg. 8], and notes that partial body absorption varies also based on individual characteristics, e.g. that ***"a child's head half as large"*** (as an adult's) will absorb more RF at some frequencies than an adult. Thus, in general this request is that individual characteristics and circumstances be considered when determining what the appropriate power density should be to assure SAR criteria are met. Circumstances considered herein will include exposure for those who wear metal eye-glass frames and also those who receive exposure from flat or corner RF reflective surfaces.

Note that this request is directed to "**all** safety standards in §1.1307 and §1.1310" and therefore include requests that power density limits based on the latest scientific literature are appropriate for both 'occupational/controlled environments' and 'general population/uncontrolled' environments. In this regard, important individual circumstances will include the criteria by which it is decided an individual is "fully aware of the exposure and is in control of the exposure" so that the higher exposures in §1.1310 Table 1A "Occupational/Controlled" may apply.

Request #5- ***"Therefore §1.1310 needs to be amended to include limits on peak power and pulse width which will prevent such a nuisance"*** (as the buzzes, hisses, and clicks some persons "hear" from pulsed RF). [page 9 of Petition]

Request #6- A justification is given in the Petition for a moratorium on new EMR emitting facilities because ***"...the true EMR exposure to any individual is the combined exposure from all transmitters...,"*** [pg. 10 of Petition] and, ***"no methodology has been presented in the Final Rules or in the Report and Order for evaluating thermal or non-thermal cumulative effects to individuals from all the EMR emitters that actually impact on them."*** [page 10 of Petition] In order to meet the need addressed in this request, the comments below will suggest actions and procedures to help assure appropriate evaluations and categorical exemptions are made.

4. New information is pertinent and includes may have a greater impact on children who are thus identified as 'susceptible individuals': There is new information pertinent to this proceeding which was not available since the last opportunity to file in this matter. The most recent information is a letter from Norbert Hankin of the U.S. Environmental Protection Agency; in this letter he clarifies what was meant when EPA wrote the Commission on July 25, 1996 that the Commission's approach *"addresses our concerns about adequate protection of public health."* He answered in the affirmative in response to the question, *"Is it correct that 'adequate protection' of public health pertains to thermally related health effects, and not necessarily to the nonthermal effects noted in the 1993 EPA letter?"*[140] In its Nov. 9, 1993 EPA letter to the Commission EPA noted "eye damage" and "cancer" were indicated in results which were reported in some studies of nonthermal exposures.] This clarification and the reports below further support evidence that there may be potentially adverse health effects at exposure conditions permitted by the Commission's final rule and that therefore it is in the public interest to modify such rules, and thus to consider the requests of the Petition. Specifically:

(4.1) Microwave News May/June 1996 reported[1,2] that at 900 MHz, near cellular phone frequencies, an exposure of 50 microwatts per square centimeter ($\mu W/cm^2$), 1/12th of the Commission's permitted limit at this frequency, resulted in an 18% reduction in REM sleep of adults[2]. REM sleep is important for memory and learning functions[2]. This may especially affect infants since (1) they sleep much during the day and early evening when power density levels are highest, (2) sleep long hours so the total REM sleep loss could be greater than for adults, (3) their memory and learning are rapidly developing, and (4) their head diameter is closer than adults to the optimal 25%[67] of the incoming 13 inch cellular phone or 6 inch PCS wavelengths.

4.2 (1) In June 1996, a study was published demonstrating that a therapeutic RF procedure to treat insomniacs in which only the head is exposed to 27 MHz amplitude modulated RF reported significant improvements in start and length of certain sleep stages[1,3] and at specific absorption rates (SAR) of RF power to the head 1/16th (0.1 W/kg) of the Commission's partial body 1.6 W/kg limit for the public in §2.1093(d)(2) of its rule. Further, this study is a replication of a 1994 study in Denver[4] that reported similar results. Also (2) A May 1996 study[5] for exposure as 4.2(1), reported brain EEGs supporting the results in 4.2 (1). While these exposures show improved sleep in an appropriate setting, at these or higher levels they may inadvertently in an occupational or school setting cause drowsiness and adversely affect learning, work performance, and safety.

4.3 For 2450 MHz amplitude modulated at 50 Hz with exposure levels of 100 $\mu W/cm^2$ (average SAR is 0.14 W/kg which is 33% of the 0.4 W/kg deemed 'safe' for workers[100,102,103,104] and 3.5% of the 4 W/kg hazard threshold upon which Commission exposure limits are based[100]), a July 1996 study[6] reported the immune system increased antibody production more than for continuous waves. A 1991 study similarly reports at 30 $\mu W/cm^2$ there was *"moderate elevation of PFC count (antibody producing cells) with non-pulsed microwaves and a marked elevation in the case of amplitude modulated microwaves at specific modulation frequencies."*[14] Authors of the July 1996 article note relevance to mobile telecommunications, *"because of the ELF (extremely low frequency) modulation frequency and field intensity."*[6]

4.4 A July 1996 review showed how from a theoretical perspective magnetite in human cells can provide a mechanism for coupling nonthermal levels of radiation to biological systems[7].

4.5 At the June 9-14, 1996 Bioelectromagnetics Society Meeting, it was reported for rats exposed to about 836 MHz at 0.58 to 0.75 W/kg (18.75% of the 4 W/kg hazard threshold upon which are based Commission exposure limits) there was a biological effect of the development of brain tumors[97], where in this case, there was a reduced incidence of tumors, and *"Tumors of exposed rats were smaller in volume."*[97] Especially significant for the Commission is in the July/August 1996 Microwave News it was reported this finding of a reduced incidence was statistically significant[105]. Also important new information is that researcher, Dr. Abraham

Liboff of Oakland University reported, *"This makes me absolutely sure that there could be a coupling between fields and tumor development."*[105] Moreover, a related study by Salford (1993) of brain tumor growth in rats at 915 MHz, and mostly at lower SAR than in the Adey experiment, found that for those few rats where there was a large increase in tumor area that it was exclusively among those rats which were irradiated[128](even though when all the rats are considered no statistical difference was reported). Speculation for a possible explanation for this promotion effect for sensitive rats in the Safford study includes noting that *"Microglia are the brain's representatives of the immune system. As such, they respond to any pathological situation involving immune system activation."*[136] Also, there are findings implicating stimulated microglia as a causal factor an autodestructive process which may be occurring in Altzheimer's Disease.[137] Also, other studies report stimulated microglia *"participate in the development of appropriate immune reactions"* but *"also may be involved in neuronal damage."*[137]; and that microglial-produced nitric oxide *"mediate neuronal cell death."*[138]. Thus, one may speculate that since very low levels of pulsed microwave irradiation under certain conditions stimulate the immune system[6,14], that in the irradiation levels of the Adey study stimulated the microglia which were a factor in killing cancer cells (as well as killing healthy neuronal cells), while in the lower level of irradiation under some conditions of the Salford study microglia may not have been exposed to a stimulation threshold, and thus the RF promoted the growing of the brain tumors in sensitive rats; this is suggested since at the higher levels of exposure the Salford study suggested a lesser effect (although results were not statistically significant). Also, the Adey finding is very troublesome, since it has been shown for some frequencies that only a 30 MHz spectrum shift can cause growth rates of some cells to change from 29% less than expected to 15% greater than expected[106] and other studies show frequency dependences[108,109] including of low dose (1 $\mu W/cm^2$) microwaves on the ability of chromosomes stressed from their normal shape to repair themselves[107]. Thus, since a cancer effect was demonstrated in the Adey study, and given other studies, there is a firm set of demonstrated results to make it reasonable to speculate that for telecommunication frequencies or transmission patterns there may be an adverse health effect. Indeed, all 4 studies at 2450 MHz that were reviewed in a 1993 World Health Organization

report, show animals exposed at or below 4 W/kg to RF for at least 3 months demonstrated adverse carcinogenic effects[110,53,111]. Similarly, the FDA reported, *"the data which exists strongly suggests that microwaves can, at least under some conditions, accelerate the development of malignant tumors."*[48] Thus, the above recent studies document and provide significant new support which, with other studies noted, demonstrates significant adverse health effects at low exposure levels could likely occur at Commission exposure criteria.. While there remains uncertainty, the Commission must follow a public health approach and reduce limits as requested in the Petition to prudently protect the public interest.

5. Considering views of health agencies: The Commission should follow its correct policy that *"it would prefer to defer to the expert federal health and safety agencies for guidance in this area,"*[15] and which it reaffirmed in the R&O (sec. #28). Furthermore, from a perspective of public health, ask, *"How likely is it that some people could suffer health damage if we do not take action today,"*[47] and set more strict limits? Since uncertainty is acknowledged, asking whether scientific evidence is conclusive is not the relevant issue. It is important to explicitly make this distinction because it has been reported that, *"...many members of the computer and telecommunications industry are still clinging tenaciously to a very conservative scientific framing of the decision problem,"*[47] Commission exposure criteria should not exceed those federal health agencies recommend. If future evidence shows exposure limits or exemption criteria are too strict, they can be lifted. This is the prudent course to protect the public interest.

6. Evidence for caution when evaluating responses to this petition: RF users and consultants to users have been reported to provide incomplete information, mis-information, or judgments [illegible] (IEEE 1991) were developed with lack of scientific rigor[11,13]. RF users were reported in 1995 to have made misrepresentations "knowingly and intentionally" before the California Public Utilities Commission and other governmental jurisdictions for which they were fined of over $4 million[8,9,18]. A prominent scientist was reported to have issued statements that were *"a total fabrication"*[10]. Also, some scientists have effects criteria contrary to those of EPA or the Food and Drug Administration (FDA), e.g. some scientists report for a study showing over a three fold

increase in primary malignant tumors in RF exposed rats that combining tumors from all sites "*is questionable as to its biological relevance*"[27]. Yet EPA states such results are evidence for cancer action (but minimal evidence)[28]; likewise FDA states "*this is precisely what one would expect for an agent which accelerates the progression of naturally occurring malignant cells.*"[48]

Moreover, judging the claims herein using IEEE 1991 as a standard should be done with caution because the development of this standard has flaws including (a) allowing minority views to be in the standard by requiring a super-majority to delete or modify text prepared by special committees[112]; (b) 2 of the 3 balloting committee members from federal health agencies who voted to reject IEEE 1991 gave the reasons: (i) "*not balanced in representing government, industry, and the general public,*" (ii) lacked "*agency review and comment*" of a draft, (iii) had "*very weak justifications*" for exposure increases (iv) "*brushed aside*" important papers showing "*pulsed microwaves may give responses at lower average levels than continuous waves.*"[13,19] (c) Also, while cell-culture studies are often used to suggest possible adverse effects that may support findings from live animal studies; yet IEEE 1991 reported findings, "*indicating effects, in vitro* (in cell cultures), *on cell function were considered transient and reversible with no detrimental health effects,*"[IEEE 1991 pg. 27] even when authors of some of these studies concluded otherwise, e.g. "*...it is almost certain that these effects would be disruptive of ongoing information handling processes if they were to occur in an intact nervous system.*"[69] Hence, the Commission must learn if responses to the petition of the Cellular Phone Taskforce and these comments of support are consistent with facts, with federal health agency perspectives, and understand reasons for disagreements, and to know if disagreements are based on 'lack of conclusive evidence' vs 'public health prudence' perspectives.

7. Assuring individual characteristics and the latest scientific evidence is used for determining appropriate power density to achieve basic SAR provision protections (per Request #2, #4 of Petition)

7.1 Using the latest science based literature power density levels in Table 1 §1.1310 needs to be reduced to 40% of current limits just to maintain current SAR protection provisions upon which the FCC exposure limits are based.: Standard limits on power density do not

reflect scientific findings of the relationship between power density and average SAR. Dosimetry from far field exposures in 1982 ANSI C95.1-1982 were mainly based on 1977 prolate spheroid models[120,51]. These showed that at 450 MHz, for an average man standing parallel to the electric field, the average SAR at 1 mW/cm^2 was 0.035 W/kg. Then in 1984 Guy et al.[119] made estimates using figurines of uniform material and reported it was 0.05 W/kg (facing source), 42% greater than the prolate spheroid estimate. More recently, Gandhi et al(1992)[52] used a computational method called Finite-Difference Time-Domain (FDTD) which the Commission found valid (R&O #70), and which can allow for different tissue properties. It was reported for the same standing position above an average SAR of about 0.083 W/kg, which is 66% greater than the estimate of Guy et al.[119] and 237% of the 0.035 of the prolate spheroid. Yet, while scientific advances are being made, the present IEEE 1991 standard does not reflect the latest scientific findings. Moreover, Gandhi et al.[52] report that above 500 MHz the average SAR for an average man is approximately constant at 0.08 W/kg at 1 mW/cm^2, see below (and in Exhibit 2):

For "E" position:	MHz:	500	700	915
Average SAR Isolated man		0.0846	0.0842	0.0825 W/kg

But the reference[51] recommended by (and presumably used by) IEEE 1991 which uses 1977 spheroidal models shows:

For "E" position:	MHz:	500	700	915
Avg. SAR Isolated man		0.033	0.032	0.031

Thus, the ratio of average whole body SAR from 1992 model to that of the SAR from 1977 model is:

For "E" position:	MHz:	500	700	915
		2.56	2.63	2.66

For example, at 500 MHz we compute the ratio 0.0846 / 0.033 = 2.56. This means that using Gandhi's FDTD method[52] it is seen that for 500 MHz to 915 MHz that the more scientifically reliable average whole body SAR for a given level of external power is roughly about 2.5 times higher than the more crude spheroidal models used both for ANSI C95.1-1982 and IEEE 1991.

Accordingly, limits were set throughout the frequency range where SAR is meaningful, from 3 MHz to 6000 MHz (IEEE 1991 pg. 25), limits in this range should be reduced to 1/2.5 = 40% of their current power density to assure the current basic SAR provisions upon which the Commission exposure standard is based.

7.2 Furthermore, it is seen by only using Gandhi[52]that 'occupational/controlled" and "general population/uncontrolled" both need to have exposure limits reduced. Since Gandhi[52] shows that above 500 MHz the average whole body SAR for an adult man is constant at about 0.08 W/kg for each 1 mW/cm^2, then at 1500 MHz the average whole body SAR of an average male would be 0.4 W/kg, since the allowed power 1500 MHz / 300 = 5 mW/cm^2. Consequently, since persons who are smaller than an average male work in the work force, it may be presumed that the 0.4 W/kg is exceeded for such persons and that the limits need to be reduced at these higher frequencies. Since, Commission's rules allow for higher exposure in places of transient passage (e.g. public places where people are in transit, such as bus stops) even small children and infants may be exposed to "occupational/controlled" levels (see R&O #43). Hence, the limits for 'occupational/controlled' also need to be reduced to maintain current basic SAR provisions.

7.3 Require SAR to meet individual needs includes individuals wearing metal eye-glass frames. It has been estimated that the electric field near the eyes of those wearing metal frame eye-glasses may be 10 fold higher than otherwise[45], increasing power density by 100 fold. Data from Gandhi[139] shows the SAR in the eye to be five times or more than of the whole body average SAR. Thus, at 1500 MHz it can be expected to be at least this or more, since for the higher frequencies there is greater concentration of RF energy at the surface. Hence, at 1mW/cm2 with metal framed eye-glasses, SAR could be expected to be as high as 100 fold 0.4 W/kg or 40 W/kg. Since 1.6 W/kg is now allowed for the eyes (and this is 1/25th of 40 W/kg) external power density needs to be about 1/25th of that now allowed to help assure SAR limits for the eyes are met. While the methods used to make these estimates may be improved, public safety requires using available estimates until better ones are developed.

7.3 Millimeter and near millimeter wavelengths: At frequencies above 6000 MHz limits should be no more than 0.4 mW/cm^2 because at 0.84 mW/cm2 a sample of human subjects

experienced a 'marked sense of warmth'[113] from infrared exposure while nude. Since RF can pass through clothes, clothes can cause a "greenhouse effect"[113], and given some people are heat sensitive[20,72] Moreover, since Deichman[117] found adverse effects at 10 mW/cm^2 (see 14.3.18) dividing by 2.5 to estimate a 'threshold' and then by 10 to obtain an exposure limit is reasonable. Also in the millimeter wavelength frequencies at 5 mW/cm2 [illegible], at 3 mW/cm2 changed gene conformal states were reported[121], and at 1 mW/cm2 were reported changed level of drug resistance and division rate without changes in plasmid DNA[121]. Thus, the resulting power density limits would be similar to those recommended by Gandhi[66] except upper limit would not exceed 400 μW/cm^2.

Moreover, consider:

IEEE Final List studies/references indicating the 10 mW/cm^2 power density at upper frequencies is too high - for studies below all frequencies were greater than 15 GHz

7.3.1 At 8.3 mW/cm^2 people are expected to feel 'very warm to hot' (Gandhi et al, 1986)[113]

7.3.2 At 1.7 mW/cm^2 on an arm people perceive warmth within 10 seconds. Longer or shorter durations of exposure ..are often associated with lower or higher thresholds.[114]

7.3.3 The ANSI Z136.1-1993 "Safe Use of Lasers" standard states that its limits, which include 10mW/cm^2 for 300 GHz *"may be uncomfortable to view or feel upon the skin....maintain exposure levels as far below the (limit values) as is practicable."*[115]

7.3.4 At 17 mW/cm^2 there was "muscular flaccidity or collapse (of chicks). At 20 mW/cm^2 there was mild hyperpyrexia below the frontal portion of a rat's skull. (10 mW/cm2 of IEEE 1991 has a safety factor, if any, of less than 2 which is quite unusual[96]). (Deichman et al. 1959)[116]

7.3.5 At 10 mW/cm2 "induced significant leucocytosis, lymphocytosis, and neutrophilla ...Effects on erythrocytes, hemoglobin, and hematocrit differed in the three strains.[117]

7.3.6 IEEE 1991 reference [B26] recommended 1 mW/cm^2 for the general population.[64].

8. Insofar as §1.1310 fails to state criteria rationale, address mixed frequencies, explicitly limit energy absorbed, and note problematic issues, let the 1986 National Council for Radiation Protection and Measurement (NCRP) standard parts 17.1, 17.2, 17.3, 17.4.6, 17.6, 17.6.1, 17.6.2 apply, since EPA has recommended this standard and the Commission has said it defers to EPA.

Since power density is to assure basic protections, let the Commission explicitly state basic protections in §2.1093 (d)(1) and (d)(2) apply also to fixed transmitter sites.

9. Consistent with Request #2, the transition standard IEEE C95.1-1991 ("IEEE 1991") for the PCS services should not have been chosen in its entirety, but only applied when its limits are less than Commission criteria prior to August 1, 1996, and the Commission should relicense any facilities licensed using this standard in its entirety. Since for occupational exposures at PCS frequencies, the exposures allowed by IEEE 1991 are higher than either the Commission standard previous to August 1, 1996 and higher than the new criteria effective January 1, 1997, and since, as shown in #7.3 above there is evidence of adverse effects at exposures above that allowed by previous or new Commission standards, therefore the Commission choice of this standard was capricious, contrary to the Commissions decision to use its previous standard, contrary to the Commissions decision to not use IEEE 1991 because the EPA advised in its Nov. 9, 1993 letter to the Commission that IEEE 1991 "has serious flaws that call into question whether its proposed use is sufficiently protective of public health and safety", and thus was not in the public interest - except to apply the standard in those cases where IEEE 1991 would not allow a condition that the Commission standard previous to August 1, 1996 would allow.

10. Since eye SAR to power level relationships increases with frequency above 350 MHz[52,66] until at least 1000 MHz [52] and since the hot spot range for the human head is from 300 MHz to 2000 MHz[141], therefore it is unclear why power density should be allowed to increase because total body absorption of RF power is lower - for the head and eye may be among the most sensitive parts to protect. Hence, limits below are given in constant power density. When setting protection limits, threshold values are divided by 'uncertainty' or 'safety' factors which are typically in the range from 10 to 1000, with a traditional value of 100[96].

10.1 0.05 $\mu W/cm^2$: Since adverse effects at about 0.006 W/kg are reported in IEEE Final List Papers[95], set a hazard threshold at about 1/7th of this, 0.0008 and general population protection limit using a traditional 'uncertainty factor' of 100 to get an average SAR = 0.000008 W/kg. So for cellular frequencies the limit would be about 1/10,000th of current limits or 0.05 $\mu W/cm^2$.

Other justifications include immune system effect[14] at 30 μW/cm^2, impaired nervous system activity at 5 to 20 μW/cm^2.[122], changed ovulation cycles in chickes[123] at 0.0004 μW/cm^2 for which the authors speculate was due to stimulation of the pituitary gland, at 0.00011 W/kg there was fetal loss and fetal abnormal development[124], at 1 μW/cm^2 and at 41.32 GHz suppression of effectiveness of radiation induced repair of the genome conformal state[107], at 0.2 to 8 μW/cm^2 a 2 fold increase of childhood leukemia for children living near TV towers,[125], significant differences in visual reaction time for male soldiers and reduced memory function[126] for exposures above 10 μW/cm^2, and biological efflux of calcium in vitro from nerve cells at 0.0006 W/kg and many confirming related amplitude modulated experiments[72].

10.2 2 μW/cm^2 should be considered if the Commission will not implement #19.1 option. Results to consider are those above, plus at 50 μW/cm^2 there was an 18% reduction of REM sleep[2], change in the immune system[6] at 100 μW/cm^2, at 100 μW/cm^2 a 26% drop in insulin[143], at 0.016 W/kg (about 120 μW/cm^2 for cellular frequencies) a pathological change in the blood-brain-barrier[128], at 30 μW/cm^2 an indication of damage to the blood brain barrier[59], at 0.08 W/kg there was stimulation of the production of ornithine decarboxylase[144] critical for stimulation cell growth and division (so 1/100th of 0.08 W/kg at cellular frequencies is about 6 μW/cm^2), at 2.4 μW/cm^2 the electric field is 3 V/m and may cause interference with medical devices[76], at 4.2 μW/cm^2 there is perceptible, annoying interference to many hearing aids[77], at 1 μW/cm^2 is the level below which is "typical of public exposure" to personal wireless services[129], and so this is feasible for such services.

10.3 The Commission should implement above limits, but if it refuses then consider: Use SAR: 0.008 W/kg (approx. 60 μW/cm^2 at cellular phone frequencies). A 1/10th reduction is strongly defensible. All of the above effects should be considered plus, behavioral disruption among IEEE final list papers occurred below 0.4 W/kg, at 0.4 W/kg was observed over a 3 fold increase in primary malignancies[111], at 0.6 W/kg was observed decreased learning of a maze[131] and increase in single strand DNA breaks[132], at 0.7 W/kg behavioral disruption after long term low level exposure[133]. See footnotes for other papers[83,84,85,88,89,91,92,93,98,99].

11. Whatever exposure criteria the Commission selects, protection should be stated in §1.1310 and in informational material, and to include health agency evaluations and observed adverse effects below the hazard threshold upon which adopted criteria are based. Given the already mentioned studies and the clarification of N. Hankin noted earlier, the Commission conclusion that its limits are sufficient to protect the public health (R&O #168,169) seem unwarranted.

12. Consistent with Request #2, the Commission may have misunderstood or overlooked that extending "occupational/controlled" to members of the public in transient passage through an area is contrary to Commission policy and decisions to defer to and accept EPA recommendations, is unrealistic, puts endangers the public, and is not in the public interest. The Commission said it would follow EPA recommendations to follow NCRP 1986 and also references NCRP 1986 Section 17.4.3 which discusses "transient passage" of the general public near RF facilities, and indicates that the general population/uncontrolled limits should apply. Such locations can include places, like bus stops, airports, or parks, where small children may be for extended periods. Accordingly, this definition is contrary to the Commission's own policy to follow the EPA recommendation and to use the definitions in NCRP 1986 17.4.3, it is capricious, exposes children and other in the general public to high exposures, and is contrary to the public interest. The Commiasion should modify its definitions to be consistent with NCRP 17.4.3 as recommended by EPA to which the Commission said it defers.

13 Consistent with Request #1 and #3, it is vague to state workers may be exposed to the higher tier of exposure if they are *"fully aware of the potential for exposure and can exercise control over their exposure."*(in §1.1310 Table 1, Note 1). While it may be the Commission's jurisdiction does not encompass specific workplace rules and procedures, the Commission can issue guidance and provide a framework. The key element of this to assure workers are exposed to the proper SAR noted in Request #3, is that the employer have in place a RF health and safety program given by the Occupational Safety and Health Administration ("OSHA") in its letter to the Commission.[37]. Just as the Commission can specify having 'warning signs' is an important element of informing, so to can the Commission state the RF health and safety elements given by OSHA are appropriate, without specifying detailed requirements. Since the Commission allows

for OSHA to develop detailed RF requirements for Commission licensed facilities, the Commissions rules should be modified to state this. In applications for a license, if workers will be exposed at the higher tier, worker representatives, if any, should give their assessment of the RF program. Common carriers should have a professional knowledgeable of such matters attach an assessment to the application, and a means should be provided for workers to be made aware of the RF safety program report and to be able to comment on it..

14. Consistent with Request #4, for reasons given in NCRP 1986 which was recommended by the EPA, to whom the Commission says it defers regarding health issues, NCRP 1986 17.4.7 provides for general population exposures for workers when signals have special modulation. While EPA indicated there was not enough evidence to justify this lowering for the general population, it left stand the NCRP recommendation. Hence, the Commission's decision appears inconsistent, and not in the public health interest of workers.

(9) Consistent with Request #1 and #2, given all of the above the Commission should adopt a policy of keeping exposures "as low as reasonably achievable." (ALARA). Given that the EPA has stated *"EPA has not conducted any study which concluded that there is a level at which there cannot be any non-thermal effects, nor are we aware of any peer reviewed study which reach that conclusion."*[134] Also, a March bill in the State of Washington became law stating, *"exposures should be kept as low as reasonably achievable while still allowing the operation of these networks."*[135] Likewise, the standard of the International Radiation Protection Association specifies, *"In view of our limited knowledge on thresholds for all biological effects, unnecessary exposure should be minimized."*[104] Also, NIOSH explicitly advised the Commission, "The standard should note that other health effects may be associated with RF exposure and that exposure should be minimized to the extent possible."[49] Finally, federal regulations for nuclear facilities already have provided for keeping exposures, "as low as reasonably achievable." 10 CFR §20.1(c)(1983). Therefore, the Commission is urged to do likewise per Petition requests.

A. Modifications needed in §1.1307 (actions with significant environmental impact):

10. Request #6 indicated poor methodology to identify high exposure conditions; the following suggestions may reduce this risk. (1) consider lowest transmitter instead of 'center of

radiation', since when there are multiple transmitters, the center of radiation may be high while there are still transmitters near ground.. (2) Also, a low height single transmitter[23,24,25,44] just above 10 meters may have sufficient power so out-of-compliance exposure occurs at nearby buildings (e.g. at 43 feet from a 3000 ERP antenna a person in a building and at the height of the antenna may receive an out-of-compliance exposure. Also, independently located but nearby antennas can cause out-of-compliance, e.g. 4 antennas at 2500 watt ERP at the corners of a 100 foot square with an apartment of the same height at the center, could result in the apartment receiving 186 $\mu W/cm^2$ from each transmitter, with a total 744 $\mu W/cm^2$ exceeding limits. The above illustrates that there will be no 'site owners' and nearby antennas can be owned by different persons. A likely solution is to use a database service with Commission data, such as Interactive Systems, Inc. which can provide all Commission licensees within a given radius of a site, and indicate the ERP for licensed antennas and other characteristics. Also, a brief conversation with Interactive Systems, Inc. indicated they may prepare software that could provide power density estimates for all areas near an identified site. This technology solution would thus avoid the impossible task of identifying owners of sites, since 'virtual sites' may be collections of antennas different properties, with different owners -rendering the concept of 'site owners' a practical impossibility. However, using database technology may be a solution - if additional antenna and accurate geographic coordinates are provided as is now possible. This can provide an efficient system wide solution.

11. Notifying those affected: Per Request #6 to improve methodology of evaluation, the Commission should require license applicants to notify residents, *schools, and hospitals within 1000 meters of a facility, the local jurisdiction, and those expected to be exposed to a site as a concomitant of employment, any organization representing them, and potential lessors of the details of what is planned and provide Commission approved health and safety information - similar to what many states require for providing insurance information.*

12. Keep facilities far from schools until safety is well documented: Pursuant to Request #1 and #2, since affects may occur at extremely low levels[123] transmitters not be placed near schools and no new licenses for such transmitters should be given. The Commission should recognize this

is not only a health concern, but also generates much strife when such facilities are at or near schools. Public policy has begun to recognize this. Neither the San Francisco School District[30], nor some other school districts[91], nor the Ministry of Education in New Zealand[31,32] allow new leases. The Commission should follow suit with no such facilities 1000 meters from a school.

13. Basic provisions on the rate of absorbed RF [illegible]

Footnotes

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9. "ATTENTION LA Cellular has been investigated by the California Public Utiliteis Commission," Los Angeles Times, April 16, 1995, page A14.

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16. Federal Communication Commission Report and Order FCC 96-326, footnote 41
17. Federal Communication Commission Report and Order FCC 96-326, page 12, 13
18. California Public Utilities Commission Decision I-92-01-002, filed January 10,1992.
19. IEEE ballot committee SCC-28 results on project C95.1, dated May 14, 1991.
20. Environmental Protection Agency letter from Margo Oge dated November 9, 1993 to the Federal Communications Commisson regarding ET Docket 93-62
21. Federal Communication Commission Report and Order FCC 96-326, paragraph #40
22. "Revising ANSI RF/MW Limits: Debate Often Contentious", Microwave News September/October 1989
23. Seattle Times, July 19, 1996, "Cellular towers go undercover," by Associated Press, Section D page 1.
24. "Shared Resources: Sharing Right of Way for Telecommunications," US Department of Transportation, April 1996
25. Engineering reports for transmitters of 35 and 45 feet in height with effective radiating power of 3000 Watts were prepared for the City of Seattle for the Edgewater and Laurelhurst areas, and located in Seattle Washington at 2013 43rd Avenue East and 5450 Sand Point Way respectively. These are examples of low height but powerful transmitters.
26. For the transmitters in footnote 25 above, using the Commission's formulas in FCC OST Bulletin No. 65, at 43 feet power density in microwatts per square centimeter = 580 microwatts/square centimeter at building heights equal to that of the transmitters, using formula power in microwatts per sq. cm. = (Adjusted ERP in watts) *1.64 * 2.56 *100/ (4 * π * (Distance in meters)^2
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